

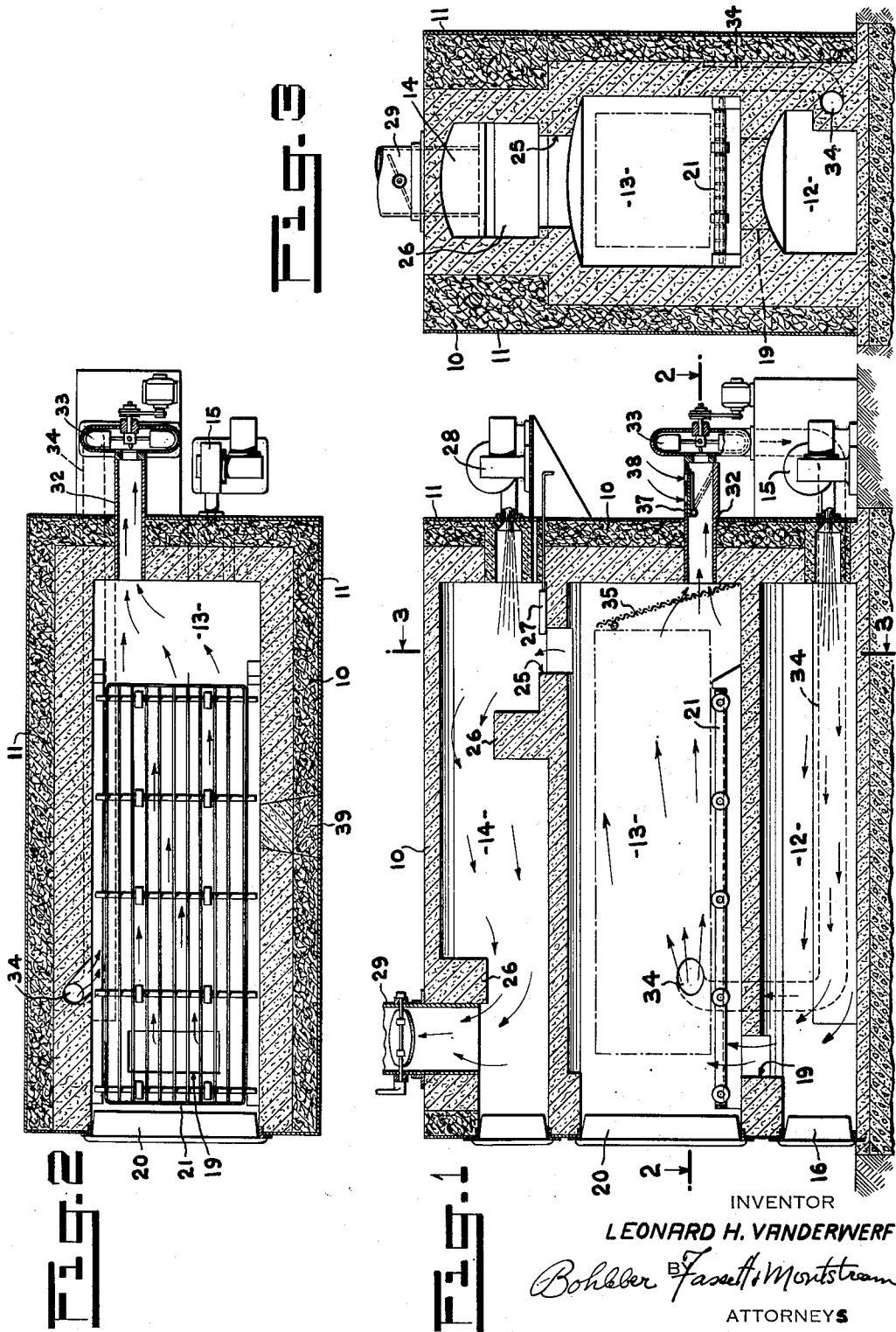
Jan. 13, 1953

L. H. VANDERWERF

2,625,121

METHOD AND APPARATUS FOR CONSUMING BODIES

Filed April 22, 1948



UNITED STATES PATENT OFFICE

2,625,121

METHOD AND APPARATUS FOR CONSUMING BODIES

Leonard H. Vanderwerf, New York, N. Y.

Application April 22, 1948, Serial No. 22,693

12 Claims. (Cl. 110—3)

1

The invention relates to a method of consuming of calcining the consumable portions of a body and a retort or furnace for carrying out the method. The invention is an improvement upon my Patent 2,365,983 dated December 26, 1944.

In my Patent 2,365,983 a separate chamber sealed from the burner gases was provided within a furnace in which chamber a non-combustible atmosphere was maintained. With this construction the fuel for the burner in the furnace receives an excess of oxygen or atmosphere which would consume a body with flame if the body were within the furnace and unprotected by the chamber walls. The invention herein provides no separate chamber but the body is inserted within the furnace and a burner is utilized which is capable of consuming most of the oxygen fed to it so that the resulting atmosphere within the furnace is carbon dioxide and nitrogen but without free oxygen or sufficient free oxygen to support combustion of the body with a flame. Some combustion does occur; however, it is not sufficient to flame as will appear more fully hereinafter.

The process or method of consuming a body without flame by keeping the free air or oxygen content below that which will result in flaming is successful; however, it takes too long or six hours to consume the body. It has been found that the time for the calcination or consuming of a body without flame can be materially reduced or the process speeded up by the method to be described herein.

It is an object of the invention to provide a method of and retort for calcinating or consuming a body without flame, without the need of a separate chamber for the body.

Another object of the invention is to provide a method and retort for consuming or calcinating a body within a retort or furnace and to limit the amount of oxygen or atmosphere fed to the burner so that there will be either no oxygen in the retort or furnace or the amount of free oxygen within the furnace will be insufficient to cause the body to flame.

Another object of the invention is to provide a method and an apparatus for substantially reducing the time of calcinating or consuming a body without flame by recirculating the atmosphere or gases within the furnace so that the flow over the body is substantially increased.

Other objects of the invention will be more apparent from the following description when taken in connection with the accompanying

2

drawing showing a preferred embodiment thereof in which:

Figure 1 is a partial section through the retort or furnace;

Figure 2 is a horizontal section through the retort taken on line 2—2 of Figure 1; and

Figure 3 is a section through the retort taken on line 3—3 of Figure 1.

The method is practiced in a calcinator, retort or furnace having walls 10 of fire resisting material of any suitable kind, the walls shown including an outer layer of mineral wool and an inner layer or wall of fireproof plastic. The walls are encased in a welded steel sheathing 11 which seals the furnace or retort and prevents in-seepage of air or outside atmosphere into the retort through the insulating wall or through cracks therein. The furnace is divided into essentially three chambers 12, 13, and 14. The three chambers are shown as arranged one above the other although this arrangement is not essential. Chamber 12 is a combustion chamber and a burner heats the same, which burner can be regulated for the air intake so that no excess or free oxygen results after combustion of the fuel or at most the excess is insufficient to cause flaming of the body. The burner particularly shown is an oil burner 15 which blows fuel and air into the combustion chamber 12 and the air thereto is so regulated that there is no excess or substantially no excess oxygen or insufficient oxygen to support a flame. The combustion chamber includes a clean-out door 16 which is sealed to prevent in-seepage of air.

The hot gases or atmosphere from the combustion chamber 12 pass through an opening 19 at one end thereof into the calcinating or consuming chamber 13. The calcinating chamber has a door 20 at one end thereof for insertion of the body in its casket and this door is also sealed such as with a gasket so that no or substantially no in-seepage of air can occur at this point. A roller platform 21 is provided for rolling the casket into the calcinating chamber and may rest upon a ledge at each wall within the chamber.

There is an opening 25 from the calcinating chamber at the end thereof remote from the opening 19 so that the hot atmosphere or gases pass into the volatiles consuming or smoke chamber 14. There may be baffle walls 26 therein to create swirling or eddying whereby the volatiles released from the body are burned more readily. The opening 25 preferably has a damper 27 therein so that the opening may be adjusted to the proper size in order to assure that no at-

mosphere from the volatiles consuming chamber 14 can flow back into the calcining chamber 13. A burner 28 of any kind, that shown being an oil burner, is directed into the chamber 14 with at least sufficient excess of oxygen so that all volatiles, smoke, etc., are consumed therein. The products of combustion pass out of the stack 29.

The method for consuming or calcinating a body comprises the steps of exposing or subjecting the body to a temperature which volatilizes the volatilizable matter of the body in an atmosphere having insufficient free oxygen such that the atmosphere will not support combustion or at most will not support a flame. A temperature of 1200° F. is satisfactory within the furnace, retort and calcining chamber although the method is operable within a reasonably wide latitude in temperature. The process is naturally slower at lower temperatures, other conditions being the same. At temperatures of 600° F. the volatiles will not be driven off or the process is so slow it is not commercial. Without any oxygen remaining within the retort or furnace after the combustion of the fuel from the burner 15 or an amount insufficient to support a flame, the body will not flame but is subjected to a temperature such that the volatilizable matter of the body including moisture becomes gaseous and passes to the chamber 14 where the volatiles are consumed or burned away from the body. The temperatures may be higher, however, the insulating material and other parts do not stand up as well or result in operating problems. The atmosphere within the retort is maintained by the sealing steel sheathing 11 with an amount of free oxygen insufficient to support flaming of the body. Although the sheathing encloses the sides of all three chambers it is necessary only that the chambers 12 and 13 be airtight or substantially airtight. With the pressure within the calcining chamber 13 normally being higher than in the chamber 14, the sheathing need not be included therebetween. If the chambers were separated then provision should be made to seal chambers 12 and 13 against air in-seepage. The retort or furnace described is operable by the method described.

The method of consuming or calcinating a body as described above works successfully but it takes about six hours which is a greater amount of time than is desirable since it prevents maximum utilization of the furnace or retort. It is for this reason that the air in the calcinating chamber is recirculated to substantially increase the velocity of the gases over the casket and body, which increased velocity increases the speed of volatilization including dehydration of the body. It has been found that an increase in velocity to about 400 cubic feet per minute increases the speed of volatilization so that the speed of calcining a body is substantially increased. With the recirculation it takes about three hours to completely calcine a body when subjected to a temperature in the neighborhood of 1200°.

The recirculation of the air within the calcining chamber 13 may be accomplished in any suitable fashion; the recirculating means shown includes an outlet 32 at the other end of the calcining chamber from the outlet 19 which connects with a fan 33 and a duct or pipe 34 extends from the outlet of the fan to the opposite end of the calcining chamber. By so recirculating the atmosphere or hot gases at the rate of about 400 or more cubic feet per minute, the velocity of

the gases flowing over the body is substantially increased which increases the speed of volatilization of the volatilizable matter of the body. Preferably the pipe 34 passes through at least a portion of the combustion chamber 12 covered over or protected by the insulating plastic so that the gases as they flow therein are preheated before again being admitted to the calcining chamber and passed over the body. By recirculating the atmosphere within the calcining chamber 13 there is no change in the oxygen content thereof and it still constitutes primarily carbon dioxide and nitrogen with no oxygen or at most an insufficient amount to cause flaming. With recirculation a higher temperature than 1200° is not recommended because the fan 33 deteriorates rapidly with materials available and operating conditions become difficult such as cooling of bearings. However, higher temperatures can be used satisfactorily for the process if and when fans are available for operating satisfactorily at these higher temperatures. A protecting screen 35 may keep debris from entering the recirculation duct.

The outlet 32 preferably has a recirculation valve or damper 37 therein which serves a double function. The wall of the outlet 32 has inlet holes 38 therein. The damper 37 in full open position closes or substantially closes these air inlet holes which is the position shown in Figure 1. When the damper is fully closed there is no recirculation of the gases in the calcining chamber 13. The damper may be put at any intermediate position. The primary purpose of the damper is to keep it in the position shown in Figure 1 during the step of driving off volatilizable matter from the body so that no outside air enters the furnace other than that provided for the burner 15. As described in this step a non-combustible or non-flaming atmosphere is maintained in the calcining chamber. When all of the volatiles have been driven off there may be a residue comprising primarily carbon and calcinacious material. When this point is reached oxygen or outside air may be fed into the chamber such as through the openings 38 by adjustment of the damper to burn the carbon residue and since it is carbon it glows rather than burns with a flame and is consumed with a combustible atmosphere having an excess of oxygen. The body is thereafter completely consumed and all that remains is the calcinacious non-combustible material. The recirculation damper permits the burner air inlet to remain in its final adjusted position and the changes in outside atmosphere requirements if any may be taken care of by the recirculating damper.

The recirculation means serves also as a means to rapidly cool the calcining chamber 13 after completion of the process. The damper 37 is closed so that the inlet holes 38 are fully open and cool air is blown through the chambers 13 and 14 and out the stack. The calcining chamber is very rapidly cooled thereby to a temperature at which it may be safely opened.

It is preferable to operate in an atmosphere which has some free oxygen but not enough to cause the body to flame. If there is some oxygen present then the carbon is reduced with the driving off of the volatiles so that both actions take place simultaneously but without flaming. In operating the retort or furnace by the preferred method described herein, the burner 28 is first ignited until the volatiles consuming chamber

14 is about 1200° F. The casket with its body may be inserted at this point or before the burner 28 is ignited. The burner 15 is now started and ignited and continues to operate throughout the process. The recirculation fan is also set into operation. The air intake to the burner is initially set to feed an excess amount for the first body to be calcined. The air is then reduced until the body does not flame and the burner air inlet remains at this setting thereafter although it may be increased or decreased depending upon conditions or changed conditions but it is set to provide insufficient excess air within the calcining chamber 13 so that flaming does not occur. When the driving off of volatiles and moisture is proceeding, the burner 28 may be shut off since the volatiles provide sufficient fuel to the chamber 14 to maintain the temperature therein for consuming or burning of the burnable volatiles.

The burner 15 usually provides about 150 cubic feet of atmosphere per minute. The damper 27 is set to provide an opening to pass the same amount of atmosphere whatever it may be that is supplied by the burner. The setting can be determined by noting the pressure in the chamber 13. If the pressure increases, the damper is not opened sufficiently. If the damper is opened too wide there may be a return flow from chamber 14 to chamber 13 which is not desired since chamber 14 has an excess of free oxygen or outside atmosphere therein. The simplest way of setting the damper is to close it gradually until a pressure starts to build up in the chamber 13, after which the damper is opened slightly. In this position it is set approximately at the output of the burner.

It will be noted that the burning of the fuel occurs in chamber 12, that the body and casket are in a separate but connected chamber 13 and that the recirculation occurs only in the chamber 13. The higher velocity recirculating gases, therefore, do not affect the burner 15 which might otherwise be "sucked out" or extinguished by suction from the recirculating gases.

A suitable safety plug may be inserted in the wall and merely held in the wall by frictional contact in the opening. This safety plug will blow out in the event the pressures become too high in the chambers 12 and 13.

This invention is presented to fill a need for improvements in a method and apparatus for consuming a body. It is understood that various modifications in structure, as well as changes in mode of operation, assembly, and manner of use, may and often do occur to those skilled in the art, especially after benefiting from the teachings of an invention. Hence, it will be understood that this disclosure is illustrative of preferred means of embodying the invention in useful form by explaining the construction, operation and advantages thereof.

What is claimed is:

1. A method of consuming a body without flame comprising burning a fuel in a retort with a limited amount of outside air the products of which burning provides an atmosphere having a temperature which will volatilize the volatilizable matter of a body and having no or an insufficient amount of free oxygen to cause flaming of the body, passing the atmosphere directly over the body to volatilize the volatilizable portion thereof, excluding excessive free oxygen from the atmosphere to prevent flaming of the body while passing over the body, conducting the volatilized gases away from the body and supplying an

oxidizing atmosphere to the volatilized gases to consume the same.

2. A method as in claim 1 in which the burning of the fuel is continued with no or substantially no free oxygen whereby a residue remains containing non-volatile combustible material, and thereafter subjecting the residue to an atmosphere having a temperature which will consume consumable portions of the residue and also having an atmosphere which will support combustion.

3. A method of consuming a body without flame comprising flowing gases at a relatively low velocity into a chamber containing the body to subject the body thereto, the gases being at a volatilizing heat and free from an atmosphere which will support flaming, recirculating the gases in the chamber over the body at a substantial increase in velocity of the flow into the chamber, excluding excessive free oxygen from the atmosphere to prevent flaming of the body while passing over the body, conducting the volatilized gases away from the body, and supplying an atmosphere having excess oxygen to the volatilized gases to consume the same.

4. A method as in claim 3 including subjecting the residue to an atmosphere having a temperature which will consume remaining consumable portions thereof and an atmosphere which will support combustion.

5. A method as in claim 3 including burning a fuel in a combustion chamber remote from the body while supplying sufficient air to burn the fuel but an insufficient excess so that an atmosphere of gases is provided free of sufficient excess air to support flaming, which gases are those to which the body is subjected.

6. A method as in claim 5 including the step of thereafter subjecting the residue to an atmosphere having a temperature which will consume remaining consumable portions thereof and an atmosphere which will support combustion.

7. A calcination retort comprising a combustion chamber, a burner connected with the combustion chamber to provide a volatilizing atmosphere therein and capable of burning the fuel with insufficient resultant oxygen to support a flame, a calcination chamber having an opening in the wall thereof to pass a body, a door closing the opening, a connection between the combustion chamber and the calcination chamber, a volatiles consuming chamber connected with the calcination chamber, a burner connected with the volatiles consuming chamber, a chimney connected with the volatiles consuming chamber and a sealed sheathing at least around the sides of the combustion chamber and the calcination chamber.

8. A calcination retort as in claim 7 including the chambers being in stacked relation with the combustion chamber being at the bottom, the calcination chamber above the combustion chamber, and the volatiles consuming chamber above the calcination chamber.

9. A calcination retort comprising a combustion chamber, a burner connected with the combustion chamber to provide a volatilizing atmosphere and temperature therein and capable of burning the fuel with insufficient resultant oxygen to support a flame, a calcination chamber having an opening in the wall thereof to pass a body, a door closing the opening, a connection between the combustion chamber and the calcination chamber, a volatiles consuming chamber, a connection connecting the volatiles con-

7

suming chamber with the calcination chamber, a burner connected with the volatiles consuming chamber, a chimney connected with the volatiles consuming chamber, a sealed sheathing at least around the sides of the combustion chamber and the calcination chamber, recirculation means having a duct with an outlet at or adjacent one end of the calcination chamber connected with an inlet at or adjacent the other end of the chamber, and fan means in the duct to recirculate the atmosphere in the chamber at higher velocity.

10. A calcination retort as in claim 9 including extending the duct through the combustion chamber.

11. A calcination retort as in claim 9 including an air inlet in the duct, and means to open and close the same.

8

12. A calcination retort as in claim 11 in which the means to open and close the air inlet in the duct also opens and closes the duct as the air inlet is closed and opened.

LEONARD H. VANDERWERF.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,182,195	Moore	May 9, 1916
1,579,642	Burns	Apr. 6, 1926
1,950,212	Barnett	Mar. 6, 1934
2,365,983	Vanderwerf	Dec. 26, 1944